

Attachment 5
Protocol for Evaluating Selective Catalytic Reduction on a Reheat Furnace

As required by the Consent Decree, Nucor will evaluate the use of selective catalytic reduction (SCR) on a new reheat furnace to be installed at its Darlington, South Carolina facility. SCR is expected to significantly reduce NOx emissions from reheat furnaces. This protocol presents the approach Nucor will use for this pilot study. Any provisions of this protocol, including schedule, may be modified by agreement of the United States and Nucor at any time.

A. Approach for Darlington Facility

Prior to initiating any testing program, Nucor will prepare and submit to EPA for approval a detailed testing and monitoring plan. The plan will include a description of the test methods to be used, a discussion of test procedures, and a description of sampling locations.

1. Design and Installation of SCR System

Nucor will meet with SCR vendors to discuss the design of the SCR system. Nucor will provide the vendors with specifications for the Darlington reheat furnace, including exhaust gas flow rates, exhaust gas temperatures, and predicted exhaust gas Nitrogen Oxide (NOx) concentrations. Nucor will develop a request for quotation that will include a design for the SCR system, a price quote for the system, guaranteed NOx removal efficiencies, and guaranteed ammonia slip values.

Nucor will select the final design of the SCR system and the SCR system vendor. Nucor will work with the vendor to install the SCR system. Nucor will then operate the reheat furnace with the SCR system for sufficient period of time to optimize the reheat furnace operation and SCR system performance.

2. Baseline Testing

After optimizing the furnace, Nucor will conduct baseline testing of the reheat furnace. During the baseline test, the SCR system will not be operational. Nucor will monitor and

record NO_x, Carbon Monoxide (CO), Oxygen (O₂), Carbon Dioxide (CO₂), and Sulfur Oxide (SO_x) emissions from the furnace for a period of 5 days for the baseline test. Nucor will also determine gas temperature, the velocity of the exhaust gas, the molecular weight of the exhaust gas, and the moisture content of the exhaust gas in accordance with EPA methods 2, 3A, and 4.

3. Evaluation of SCR System

Following the baseline testing, Nucor will begin evaluating the impact of the SCR system on NO_x emissions. Nucor will use continuous emission monitors to monitor and record NO_x, CO, O₂, CO₂, and SO_x emissions. Nucor will also use a CEMS to monitor ammonia emissions. Nucor will monitor emissions at the maximum exhaust gas flow rate for the furnace, at an intermediate flow rate, and at the minimum flow rate for the furnace. This will allow Nucor to determine the effectiveness of the SCR system under a range of operating conditions. Nucor will also determine the exhaust gas temperature, velocity of the furnace exhaust gas, the molecular weight of the exhaust gas, and the moisture content of the exhaust gas in accordance with EPA methods 2, 3A, and 4. If both Nucor and EPA agree that the data is representative or cannot be repeated on a comparative basis, the specific test will be considered complete.

4. Report to EPA

Nucor will prepare a report for EPA that will include the results of the evaluation test program, any problems encountered in operating the furnace that might be associated with the SCR system, and the cost effectiveness of the SCR system based on the results of the evaluation test, the capital cost of the system, and actual operation and maintenance costs of the system. Nucor will submit a copy of all electronic data to EPA with the report.

5. Schedule

Table 1 presents the schedule for the SCR pilot study at the Darlington facility.

TABLE 1. SCHEDULE FOR SCR PILOT STUDY AT DARLINGTON

ACTIVITY	PROJECTED DATE
Design of reheat furnace	6 months after permit approval
Fabrication of reheat furnace	18 months after permit approval
Installation of reheat furnace	24 months after permit approval
Submit test plan to EPA	At least 30 days before testing begins
Evaluation testing of SCR	45 days after full operation commences
Report to EPA	60 days after testing completed

B. Second Pilot Study

If Nucor and EPA agree that SCR is economically and technically feasible based on the pilot study at Darlington, Nucor will conduct a second SCR pilot study on an existing reheat furnace. Nucor will include a recommendation for the site for the second pilot study in its report to EPA on the Darlington pilot study. Nucor will also include a schedule for implementing the second pilot study in the report.

C. Evaluation of Control Technologies for Other Nucor Reheat Furnaces

Nucor has committed to installing either exhaust gas recirculation with reduced NO_x burners (EGR/RNB) or SCR on their remaining reheat furnaces. In conjunction with the SCR

pilot study at the Darlington facility and on a second reheat furnace, Nucor is also conducting an EGR/RNB pilot study on a reheat furnace at its facility located in Norfolk, Nebraska. At the conclusion of these pilot studies, Nucor will prepare a report for EPA that presents a comparison of the two technologies. The comparison will include an analysis of the NOx control efficiency of each technology, the cost effectiveness of each technology, and an analysis of other environmental and energy impacts associated with each technology.

Nucor will include in the report a discussion of the factors that should be considered in selecting the most appropriate technology for a given furnace. These factors are expected to include furnace design, burner design, baseline NOx emissions, configuration of the rolling mill, and the relative amounts of time the furnace is operated at maximum and minimum flow rates.